4 Practical Design of Intelligent Agent Systems

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4.1 Introduction

Intelligent agents trace their roots to the artificial intelligence community. Unfortunately, many early customers were ‘burned’ by their experience with artificial intelligence, and are standoffish when hearing about so-called ‘intelligent agents.’ Yet several market studies (Janca, 1996) include interviews with successful adopters. These early adopters do have to live with constraints, but universally report that the agent systems save them time and/or money. It is interesting to note that not one of the interviewed early adopters would even consider removing the functioning system.

It is possible to purchase agent-enabled systems today. These systems are typically used by early adopters, who can live with the fact that most such systems:

- Apply to only a single application niche such as electronic mail, or information access, or network management. No currently available commercial agent system can work in more than one such application domain.
- Are free standing and completely self-contained. No building block approach is used, which results in every system being built from zero.
- Require the user to discard a non-enabled application with similar characteristics. If I want to add agents to an existing mail system today, tough luck. I must get rid of the system in favor of a new mail system which includes agents.

None of the above constraints presents a serious problem to the early adopter community. However, moving agent-enabled applications into mainstream use will require support of the following three imperatives:

- Key components (such as engines, interfaces) must become interchangeable within an agent system;
- Interconnection and communication must be available between agent systems; and
- Agent systems must adapt onto existing, non-agent-enabled systems.

1 Mainstream, as used here, means that a significant portion of the marketplace is aware of the technology, and a measurable quantity is using it.
While research and early adopters are successfully using agent-enabled systems without these attributes today, the general commercial marketplace can only be developed when they are available.

This study information, plus work we have done at IBM with interested customers, has demonstrated that intelligent agent systems are both practical and add value to the systems to which they are attached. While 'early adopter' applications have been introduced over the past few years, commercial, mainstream use is just on the horizon. This chapter will introduce the reader to the current state of commercial agent adoption, will describe the needs of (and problems faced by) current users, will provide a practical model for use in the general marketplace, and will show examples from current research. A companion paper is also available (Gilbert et al., 1996) which describes the technological attributes of agent systems.

### 4.2 Market State

"Agents will be the most important computing paradigm in the next ten years .... By the year 2000, every significant application will have some form of agent-enablement." (Janca, 1996)

There are several reasons for this conclusion:

- Desktop applications are becoming so feature-rich that users can master only a small part of their capabilities. Agents mask the complexity and help the user do what he/she wants.
- Sources of information are increasing, and their content is also increasing. Agents help do the data mining – as well as help locate the most productive mines.
- Greater bandwidth means more data can get to you more quickly – but the user still has only 16 hours in the day available to work. Agents help manage the flow, by sending only the information the user considers essential.
- Desktops and servers now are getting enough power to easily help users and processes.
- Rapidly increasing use of the Internet and World Wide Web is creating a much more complex computing environment. Many people are beginning to refer to this as 'network-centric' computing. This implies that we are moving from simple connections (i.e., a terminal-to-a-host, or a client-to-a-server) into the complex world of multiple servers and services interconnected like a highway network. Everything is available, but services change by the second, and the

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2 Market state information comes from interviews with over 50 vendors of agent enabled applications. Users of these applications were also interviewed. The work and analysis was done by Peter Janca prior to becoming affiliated with IBM.